Peripheral Arterial Ulcers

A guide for Alberta with a focus on Indigenous health.



This BPR Brief is an abridged version of the **Best Practice Recommendations for the Prevention and Management of Peripheral Arterial Ulcers**. In alignment with a global health-care perspective, Wounds Canada is committed to provide support to patients to help them adapt to and self-manage their condition in the face of social, physical and emotional challenges. This document uses the Wound Prevention and Management Cycle (WPMC) (Figure 1) as the basis for clinical decision making. For clinicians, this document is meant as a cue for treatment; it provides non-inclusive examples listed below each recommendation. For policy makers, it highlights (in **bold italics**) actions and policies that support best practice.

Wounds Canada follows a population health strategy for wound care that enables us to address the entire range of individual and collective factors that determine health, including:

- Better health: health of the general population improved; behavioral, social, economic and environmental determinants addressed; preventative care rewarded
- Better health care: patient-centred, reliable, safe, evidence-based treatment; care managers co-ordinate total health-care delivery; evidence-based treatment with outcome tracking
- Better value: costs and cost improvements monitored; readmissions to hospital reduced; early interventions to reduce per patient cosst implemented; unnecessary or duplicate procedures eliminated; information management technologies utilized

For more information on content, levels of evidence or tools related to a particular recommendation, click on the links provided.

We strongly recommend that before using this BPR Brief the user read the full best practice recommendation (BPR) document. To obtain a copy of the full document, go to: www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1690-wc-bpr-prevention-and-management-of-peripheral-arterial-ulcers-1921e-final/file.

Introduction

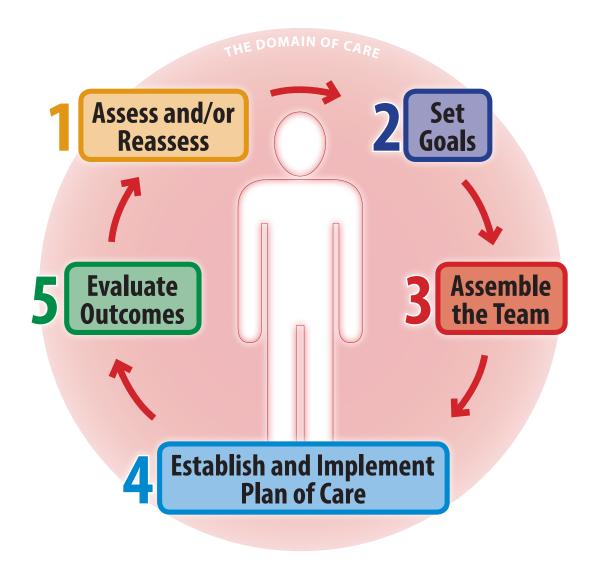
Peripheral arterial disease (PAD) is a chronic disease of the cardiovascular (CV) system that can impact both the upper and lower extremities; it is more common in the lower limbs. PAD occurring in the lower extremities is referred to as LEAD (lower extremity arterial disease) and often results in tissue ischemia and ulceration. LEAD may develop spontaneous ulcerations that fail to heal or that progress to gangrene and critical limb-threatening ischemia (CLTI), amputation and even death. Smoking and diabetes are the two primary risk factors predisposing an individual to LEAD and the development of an arterial ulcer.

It is important to remember that skin and wound care is to be collaborative, using a patient-centred approach based on respect, dignity, empathy, compassion, cultural appropriateness and shared decision making.

Disclaimer: This document provides a clinical enabler for the recommendations outlined in the Best Practice Recommendations (BPRs) for the Prevention and Management of Peripheral Arterial Ulcers. For more information on a particular recommendation or a copy of the full document go to: https://www.woundscanada.ca/docman/public/health-care-professional/bpr-workshop/1690-wc-bpr-prevention-and-management-of-peripheral-arterial-ulcers-1921e-final/file.



Figure 1: Wound Prevention and Management Cycle (WPMC)





1 Assess and/or Reassess

- Assess the patient, the wound (if applicable), as well as environmental and system challenges.
- Identify risk and causative factors that may impact skin integrity and wound healing.

Assessment must take place to determine the causes and factors that may impact skin integrity and wound healing. Patient assessment includes history and current health status, skin status (and wound status, if applicable), environmental factors and system factors. If, after the WPMC has been completed, the goals of care have not been fully met, reassessment must take place, followed by the rest of the recommendations in the WPMC steps. Assessment tools need to be available and in use in all care settings, supported by staff education and policy.

1.1 Select and use validated patient assessment tools.

Table 1 describes some of the tools available for use in the assessment of persons with or at risk for lower extremity arterial ulcers. Note: This list is not exhaustive.

Table 1. Vascular Assessment Tools

Category	Tool	Purpose	
Ischemia	Rutherford Classification System	Assesses degrees of ischemia and tissue loss	
	Fontaine Classification System	Assesses degrees of ischemia	
	Lower Extremity Threatened Limb Classification System	As above plus assessment of diabetes and severity of infection	
Pain	Rose Questionnaire	Assesses extent of ischemia related to activity and	
	Edinburgh Claudication Questionnaire	pain experience	

1.2 Identify risk and causative factors that may impact skin integrity and wound healing (patient, wound, environment and system).

1.2.1 Patient: Physical, emotional and lifestyle

Assessment needs to include baseline information pertaining to patient health status, knowledge, beliefs, perceived learning needs and possible risk factors, including:

- General health, including co-existing diseases such as diabetes, nutritional status, smoking history
- Mobility level
- Dependence related to activities of daily living
- Skin, including fragile skin and previous injuries

It is critical to provide a culturally sensitive environment for care.

Pain is an important indicator of LEAD. A thorough pain assessment can determine extent of ischemia (e.g., intermittent claudication, pain at rest, night pain) as well as level of pain through the use of a standardized tool (see Table 1). It is also significant to assess what relieves the pain, such as dependency of the limb.

Clinical diagnosis may be made through physical assessment of symptoms through a complete lower leg assessment as well as diagnostic testing by trained professionals that may include: ABPI, ABPI with treadmill, toe pressures, duplex ultrasound, PVR, Doppler waveforms, TCPO₂, leg segmental pressure, CTA, MRA, conventional angiography.



1.2.2 and 1.2.3 Environment and System Factors

Environment and systems factors need to be assessed, including food security; access to housing that accommodates disabilities; social supports; health behaviours; funding for preventative or treatment supplies, equipment and services; and access to and availability of health-care services. Ensuring that the appropriate professional, community-based support services and resources are accessible may be critical to the overall success of a plan of care designed to prevent and manage vascular disease.

The level of arterial disease can be established once the assessment is complete by using a standardized classification system (see Tables 2 and 3).

Table 2. Acute Limb Ischemia Classifications

Viable	Limb not immediately threatened; no sensory loss; no muscle weakness; audible arterial and venous Doppler			
Threatened	Mild to moderate sensory or motor loss; inaudible arterial Doppler; audible venous Doppler			
	May be further divided into IIa (marginally threatened) or IIb (immediately threatened)			
Irreversible	Major tissue loss or permanent nerve damage inevitable; profound sensory loss, anesthetic; profound muscle weakness or paralysis (rigor); inaudible arterial and venous Doppler.			

Table 3: Assessing Arterial Flow and Perfusion

Grade	Ankle-Brachial Pressure Index	Toe Brachial Index	Toe Pressure	Waveforms	Transcutaneous Oxygen Pressure (indicating perfusion)
Non- compressible	> 1.40 Be aware of possible falsely elevated measures	Preferred when vessels are non- compressible	Preferred when vessels are non- compressible		Preferred when vessels are non-compressible
Normal Range	1.0-1.40	>0.7	>70 mmHg	Triphasic	>40 mmHg
Borderline	0.91-0.99	>0.6	>70 mmHg	Biphasic/monophasic	>40 mmHg
Abnormal	< 0.90	< 0.6	< 70 mmHg	Biphasic/monophasic	<40 mmHg
Mild	0.7-0.9	>0.4	>50 mmHg	Biphasic/monophasic	30–39 mmHg
Moderate	0.41-0.69	>0.2	>30 mmHg	Biphasic/monophasic	20-29 mmHg
Severe	< 0.4 critical limb ischemia (CLI/CLTI)	< 0.2	<30 mmHg	Monophasic	<20 mmHg



1.3 Complete a wound assessment, if applicable.

The assessment of an arterial ulcer should include the location, shape, size, tissue type, presence and nature of wound exudate, presence of malodour, periwound tissue characteristics and wound pain.

Characteristics of an arterial (ischemic) ulcer include the following:

- Often on the lower extremities; less frequently on the upper extremities but can occur
- "Punched out" appearance with well-defined borders
- Often associated with little or no exudate or periwound edema
- Often deep, with possible exposure to tendon and/or bone
- Often has yellow slough or black eschar, with minimal or no granulation (figures 2, 3 and 4)
- Often associated with moderate to severe pain
- Ischemic regions may appear as dry gangrene
- Periwound tissues may be pale, shiny, dry, with loss of hair and dystrophic nails
- Often appear over boney prominences or other areas being traumatized by external pressures

The presence or absence of infection and osteomyelitis should be assessed. Assess for infection using the International Wound Infection Institute (IWII) continuum. Other tests may include swabs, bone biopsy, x-rays, blood tests for inflammatory markers, MRI.



Figure 2: Large, dry arterial ulcer (eschar) on the leg of a male, heavy smoker, non-diabetic



Figure 3: 51-year-old female with diabetes, heavy smoker, ischemic pain, TBPI: 20 mmHg



Figure 4: 57-year-old male with type 2 diabetes with sensitive neuropathy, waiting for revascularization

Figures 2–4 used with permission from Maryse Beaumier.



2 Set Goals				
• preve	ention	healingnon-healingnon-healable	 quality of life and symptom control 	

Following a comprehensive assessment of the patient's physical, emotional and environmental risk factors, goals for prevention and management of arterial ulcers can be determined in a collaborative process carried out between the health-care team, the patient and his/her care partners.

2.1 Set goals for prevention, healing, non-healing and non-healable wounds.

Prevention should always be considered a patient safety goal. Goals need to be determined from the patient's perspective and be created using the SMART principle: **S**pecific, **M**easureable, **A**ttainable, **R**elevant and **T**imely.

2.1.1 Identify goals based on prevention or healability of wounds.

Table 4 describes some of the goals that may be associated with the quality of the arterial flow to the lower leg. This list is not exhaustive and needs to be patient specific.

Table 4. SMART Goals related to Perfusion

LEAD Status	Perfusion	Examples of Goals
Borderline*	Adequate	 Wound closure within 3 months following revascularization Appointment with vascular specialist as soon as possible Prevention strategies implemented in relation to wound infection, new trauma and pressure injury before discharge
Post revascularization (remains patent)	Adequate	 Wound closure within 3 months following revascularization Appointment with vascular specialist as per surveillance protocols Prevention strategies implemented in relation to wound infection, new trauma and pressure injury before discharge
Post revascularization (re-stenosis)	Inadequate	 Vascular appointment for reassessment (surveillance) and pending revascularization Prevention strategies implemented in relation to wound infection, new trauma and pressure injury before discharge
Pending revascularization	Inadequate	 Timely and successful revascularization to optimize blood flow Prevention strategies implemented in relation to wound infection, new trauma and pressure injury before discharge
Not a candidate for revascularization	Inadequate	 Prevention strategies implemented in relation to wound infection, new trauma and pressure injury before discharge
Undetermined		 Timely vascular assessment Prevention strategies implemented in relation to wound infection, new trauma and pressure injury

^{*} Borderline here would refer to patient with just enough blood flow for healing; this assessment is difficult to make and should be part of the expert opinion regarding adequate perfusion to heal even though circulation may not be within optimal ranges.



2.1.2 Identify quality-of-life and symptom-control goals.

Table 5 describes some of the goals that may be associated with quality of life (QoL) and symptom control. This list is not exhaustive and needs to be patient specific.

Table 5. SMART Goals for Quality of Life and Symptom Control

Patient Concern	Examples of QoL goals				
Comorbid conditions	 Self-management of glucose control following education and teaching within 3 weeks HbA1c ≤ 7.0 (unless contraindicated as per specialist) within 6 months LDL-C < 1.8 mmol/L (70mg/dL) or less within 6 months, or decrease by > 50% if baseline measures are 1.8–3.5 mmol/L (70-135 mg/dL) Optimal BP control: < 130/80mmHg within 3 months Smoking cessation within 6 months supported by PHC provider or risk reduction team 				
Rest/walking pain	 Ischemic pain control in conjunction with PHC provider within 1 day Pain decreases to 1 or 2 (out of10) at rest within 1–2 weeks Anticoagulant medication as prescribed within 1–2 weeks Statin as prescribed within 1–2 weeks to improve walking distance 				
Activities of daily living	 Walking 10–15 minutes longer before experiencing IC symptoms within 3–6 months of initiating a tailored exercise program Participation in supervised exercise as recommended within 3 months Maintaining a healthy diet to support glucose control, BMI and healthy skin within 3–4 months 				
Emotional, cognitive, behavioral and mental health	 Satisfaction with local wound care at every dressing change Participation in a smoking cessation program to reduce cigarette consumption to less than 1 pack a week within 3 months Engagement in self-care activities and adherence to a plan of care aimed at prevention and management of ulceration and amputation within 1–2 months 				
Infection prevention	 Participation in activities to maintain healthy feet, including not walking in bare feet, daily foot inspections and skin care, starting immediately Regular podiatric care every 4–6 weeks Footwear fitted by a qualified health-care professional immediately following the closure of a foot ulcer Awareness of signs and symptoms of infection and complications/changes that may affect blood flow to the lower extremities, starting immediately Follow-up with a PHC provider at first sign of ulceration or foot infection 				



3 Assemble the Team

· Select membership based on patient need.

Preventing and managing arterial ulcers can be challenging and can often require the consideration of multiple health-related and lifestyle factors that require the interventions of many health-care professionals and service providers, as well as the patient and their care partners.

3.1 Identify appropriate health-care professionals and service providers.

Some of the team members that may be associated with individual patient concerns include family physician, vascular surgeon or specialist, orthopedic surgeon, plastic surgeon, internal medicine specialist, risk reduction and modification specialist, infectious disease specialist, nurses (including certified nurse specialists; nurse practitioners; nurses specialized in wound, ostomy and continence care; wound specialist nurse), physical therapist and/or occupational therapist, diabetes educator, pharmacist, dietitian, pedorthist, orthotist, prosthetist, podiatrist or chiropodist, pain management specialist, psychologist, social worker, spiritual leader.

3.2 Enlist the patient and their family and caregivers as part of the team.

The team must include the patient and/or their family and care partners, as successful care hinges on their collaboration and communication with other members of the team.

3.3 Ensure organizational and system support.

Wounds Canada aligns with population health management, which is the proactive management of a total population at risk for adverse outcomes through a variety of individual, organizational and cultural interventions to improve patient, clinical and financial outcomes, based on a risk-stratified needs assessment of the population, supported by a comprehensive governance infrastructre.

To support this model and secure successful outcomes, decision makers must:

- Use globally recognized risk classifications to identify risk, support prevention and develop management strategies by allocating appropriate resources such as smoking cessation programs, patient education and clinical visits
- Develop policies (federal, provincial/territorial, regional and institutional) based on current evidence that acknowledge and designate human, material and financial resources to support the team in the development of a PAD management program.
- Establish a pathway for referral of people with LEAD at risk for arterial ulcers to a multidisciplinary service
- Work with community and other partners to develop a process to facilitate patient referral and access to local resources and health professionals with specialized knowledge in prevention and management of LEAD
- Work with community and other partners to advocate for strategies and funding for all aspects of care, including prevention and treatment
- Ensure services and programs exist for the assessment and continuing surveillance of those defined as being at increased risk in order to prevent arterial ulcers and to support management in their healthcare or community setting
- Establish, train and support an integrated team composed of interested, skilled and knowledgeable persons to address and monitor quality improvements in the prevention and management of arterial ulcers



- Establish and sustain a communication network between the person with or at risk for arterial ulcers and the necessary health-care and community systems
- Audit all aspects of the service to ensure that local practice meets accepted national and international standards of care

In order to meet these goals, establish or adopt a system-wide care pathway.



A successful plan of care should take into consideration the complexities of the condition, such as multiple comorbidities, as well as individual preferences and the lifestyle of the patient. An effective plan of care needs to be both evidenced-based and allow for patient participation throughout the decision-making process.

4.1 Identify and implement an evidence-informed plan to correct the causes or cofactors that affect skin integrity, including patient needs (physical, emotional and social), the wound (if applicable) and environmental/system challenges.

The primary goals in the treatment of LEAD and CLTI are to alleviate pain, prevent amputation and improve the QoL of the patient, which should include the closing of any existing arterial ulcers. To achieve these outcomes, most patients will require that some of the following are addressed:

- Daily foot inspections and skin care (e.g., hydrating skin with hypoallergenic moisturizer after bathing, with the skin still damp, not wet; using warm, not hot, water for bathing)
- Assistance with activities of daily living (e.g., providing protection from trauma during routine care and ADLs)



- Nutritional concerns (e.g., promoting and monitoring nutrition and fluid intake)
- Pain control associated with an arterial ulcer should include local, regional and system modalities, such as encouraging the patient to position the lower limb in a dependent position to reduce pain and optimize perfusion to the wound.
- Smoking cessation if applicable (including no smoking in the patient environment)
- Pharmaceutical intervention that may include thrombosis-directed agents, cholesterol-lowering agents, antiglycemics, anti-hypertensives
- Surgical intervention such as dilatation (with or without the placement of stents), endarterectomy, bypass surgery or extra anatomic bypass
- Major amputation (above the ankle) in patients with CLTI when there is overwhelming infection that threatens the patient's life, rest pain cannot be controlled, and when there is extensive tissue loss

4.2 Optimize the local wound environment.

4.2.1 Cleansing

Cleanse the wound and assess. The cleansing of non-healable arterial ulcers that present with dry eschar or dry gangrene is not recommended (for more information, refer to Wounds Canada's Product Pickers, below).

4.2.2 Debriding

Debride nonviable tissue to promote wound closure (**note: only if adequate blood flow is present**)

Debridement prior to revascularization in poorly perfused extremities should be performed only in a septic foot with and without ischemic signs (for more information, refer to Wounds Canada's Product Pickers, below).

4.2.3 Managing bacterial balance

Any local, spreading or systemic infection must be treated, including osteomyelitis if present. The application of topical antimicrobial dressings should be considered to minimize the proliferation of bacteria in the open wound (for more information, refer to Wounds Canada's Product Pickers, below). Povidone iodine (10% PVP-I) is one of the most extensively used broad-spectrum topical antiseptics used to minimize the bacterial burden in long-standing wounds with an inadequate blood supply.

4.2.4 Managing moisture balance

Maintaining moisture balance is recommended for arterial ulcers that are considered to have **adequate perfusion** to heal or after a successful revascularization. Non-healable arterial wounds should be painted with 10% PVP-I and covering with a gauze or breathable cover dressing to maintain a dry wound environment. (See Wounds Canada's Product Picker: Skin and Wound Clean-Up and Product Picker: Dressings.)

4.3 Select the appropriate dressings and/or advanced therapy

If adequate blood flow is present to support healing, select products that promote moist wound healing while protecting the fragile skin of those at risk. If adequate blood flow is NOT present, select products that keep the area dry and prevent infection while protecting the fragile skin of those at risk (for more information, refer to Wounds Canada's Product Pickers, below). There is a lack of strong evidence to support the routine use of advanced therapies for arterial ulcers. However, it is recommended that advanced therapies be considered to augment the wound healing progress for patients who are at a high risk for amputation.



4.4 Engage the team to ensure consistent implementation of the plan of care.

Arterial ulcer prevention programs across all age groups and levels of care must include a plan for engaging individuals, families, care partners, health-care professionals and organizations to ensure that best practices are implemented. All stakeholders must collaborate to ensure that the plan of care is successful and sustainable.

Table 6. Summary of Treatment Plan

LEAD Status	Perfusion	Treatment Plan
Borderline*	Adequate	 Treat CV risk factors Early vascular referral Offload ulcer site and manage PI risk Cautious moist wound care
Post revascularization (remains patent)	Adequate	 Treat CV risk factors Monitor for re-stenosis (surveillance) Offload ulcer site and manage PI risk Cautious moist wound care
Post revascularization (re-stenosis)	Inadequate	 Treat CV risk factors Refer for vascular assessment Manage ischemic pain Offload ulcer site and manage PI risk Monitor vigilantly for infection Avoid moist wound healing Keep ulcer clean and dry with antiseptic Consider adjunctive therapies
Pending revascularization	Inadequate	 Avoid moist wound healing Keep clean and dry with antiseptic Offload ulcer site and manage PI risk Manage ischemic pain Treat CV risk factors Consider adjunctive therapies
Not a candidate for revascularization	Inadequate	 Treat CV risk factors Monitor for increasing symptoms Manage ischemic pain Offload site and manage PI risk Monitor vigilantly for infection Avoid moist wound healing Keep ulcer clean and dry with antiseptic Consider advanced therapies
Undetermined		Treat CV risk factorsRefer for vascular assessment

^{*} Borderline here refers to a patient with just enough blood flow for healing; this assessment is difficult to make and should be part of the expert opinion judging healability of the wound based on the presence of adequate perfusion to heal even with impaired circulation.



Wounds Canada's Product Pickers

- Wound Dressing Formulary: describes common wound dressings in generic categories and lists usage considerations.
- Wound Dressing Selection Guide: helps users choose appropriate primary and secondary dressings based on common clinical situations and wound care goals.
- Skin and Wound Clean-up: helps users choose appropriate skin and wound cleansers as well as irrigating solutions.

5 Evaluate Outcomes

Goals Met:

Goals Partially Met or Not

Ensure sustainability.

Met:

✓ Cycle is completed

reassess

Regular evaluation of patient outcomes is an important aspect of care to determine whether or not the goals of care are being met. This should be an ongoing process carried out collaboratively with the patient and other members of the health-care team to ensure that the goals of care are clearly understood and are shared. If, after the cycle has been completed, goals of care have not been fully met, reassessment (Step 1) must take place, followed by the rest of the Wound Prevention and Management Cycle steps. **The plan of care needs to be revisited at discharge to ensure that self-management strategies are in place to support the patient to sustain the outcomes achieved after discharge.**

5.1 Determine if the outcomes have met the goals of care.

Regular evaluation of patient outcomes is an important aspect of care to determine whether the goals of care are being met. This should be an ongoing process carried out collaboratively with the patient and other members of the health-care team.

5.2 Reassess patient, wound, environment and system if goals are partially met or unmet.

When goals of care are not met, the team should go back to Step1 of the Wound Prevention and Management Cycle for re-assessment to identify barriers to wound healing, e.g., gaps in care, repeat trauma to the area, comorbidities that may delay healing. Reassessment needs to consider gaps in care or the person's ability to adapt to their condition and engage in self-management.



5.3 Ensure sustainability to support prevention and reduce risk of recurrence.

Ensuring access to ongoing vascular risk screening, foot care and primary health care will support the management of the associated risk for recurrent ulceration and infection.

Arterial ulcer prevalence and incidence should be monitored and tracked to allow for benchmarking and evaluation of care.

It is important to recognize that the goals of care are not merely to treat an existing arterial ulcer. Of equal importance is managing the underlying disease process and employing preventative measures to optimize function and ensure the patient's ability to carry out activities of daily living. The management of pain and associated complications of LEAD, including the recurrence of arterial ulcers requires careful consideration. Reducing the recurrence of ulcers has been shown to reduce hospital admissions, the costs associated with treatment for wound infection, community-based home visits, as well as having a significant impact on health-related quality of life.

Additional resources to support use of this enabler can be found at www.woundscanada.ca/health-care-professional/resources-health-care-pros/boutique.

Additional Resources

Information for Clinicians

- BPR Brief: Prevention and Management of Wounds
- Limb Preservation in Canada:
 - Current and emerging treatments for people living with lower limb ulcers
 - Management for people living with chronic lower-limb ulcers

Information for Patients

- Wounds Canada Care at Home Series: Prevention and Caring for Your Wounds at Home
 - Caring for Your Wound at Home: Changing a Dressing
 - Preventing and Managing Skin Injuries: Minor Trauma (Cuts, Scrapes, and Bruises)
- Wounds Canada Do-it-Yourself Series: Wound Prevention and Treatment: Do It Yourself (DIY) or Call in a Pro?
 - For All Wound Types
 - Arterial Foot or Leg Ulcer

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